

Environmental Interpretation Evaluation in Natural Areas

Jennifer K. Munro and Angus Morrison-Saunders

School of Environmental Science, Murdoch University, Australia

Michael Hughes

*Curtin Sustainable Tourism Centre, Curtin University of Technology,
Perth, Western Australia*

Environmental interpretation is widely assumed to influence visitor behaviour and reduce impacts on a natural site. Assumptions of cause and effect are difficult to attribute and relatively few studies evaluate the effects of interpretation on visitor behaviours. We reviewed a sample of the interpretation evaluation literature available through online databases. We looked at the internal validity of evaluative studies and compared different interpretive approaches in terms of outcomes. Findings indicate an evaluative emphasis on quantifying knowledge gain and attitude change with few studies extending to measurement of behavioural change. The large number of possible variables and small number of completed studies prevent substantive conclusions on the role of interpretation in promoting more sustainable visitor behaviour. Further research is needed in terms of robust evaluative studies to facilitate development of a clear understanding of interpretive programs' influence on visitor behaviour. It is problematic to assess environmental interpretation as a visitor management tool until further such evaluative studies are performed.

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Introduction

Nature based experiences are a significant part of the tourism sector and are considered to provide significant benefits to regions where it occurs (Eagles, 2002; Laarman & Gregersen, 1996; Nyaupane *et al.*, 2004). Such tourism experiences often occur in protected natural areas established primarily for conservation purposes owing to rare or unique natural phenomena (Kuo, 2002). Consequently, protected area managers place significant focus on dealing with potential environmental impacts generated as a result of tourism driven visitation to ensure protection of the ecologically sensitive environments on which tourism often depends (Galloway, 2002; Kohl, 2004; Moscardo, 1998; Wearing & Darcy, 1998; Wearing & Neil, 1999). Environmental interpretation is a ubiquitous part of natural area management strategies aimed at visitor management and impact minimisation on site (Hughes & Morrison-Saunders, 2005). As with the other management methods, it is important to evaluate interpretation programmes to ascertain whether intended management goals are being

met. Given the diversity of potential interpretation means and goals, this could prove challenging in terms of accessing a valid and reliable form of evaluation.

Environmental interpretation is often a key on-site form of communication between natural area managers and visitors. Used in combination with other regulatory management tools such as physical barriers and legal sanctions, environmental interpretation is frequently touted as playing a role in influencing visitor beliefs, attitudes, knowledge and behaviours and as such is purported to be a desirable visitor management tool (Hughes & Morrison-Saunders, 2005; Knapp & Poff, 2001; Kohl, 2004; Kuo, 2002; Moscardo, 1998). Interpretation has also been identified as a means of entertainment, a tool for encouraging increased visitation to a site, encouraging repeat visitation, longer stays and greater visitor satisfaction (Bramwell & Lane, 1993; McKercher, 1993; Moscardo & Woods, 1998). Some or all of these perceived benefits often manifest in management aims and goals for natural areas (Kuo, 2002).

In order to achieve these assumed benefits, site managers may use a range of interpretive media and techniques. Some interpretive media may be described as having more intensity than others where more intense interpretation supposedly has a greater probability of influencing the visitor. For example, interpersonal interpretation is usually ascribed as having greater intensity (and thus influence) than non-personal interpretation (Hughes & Morrison Saunders, 2005). Wearing and Neil (1999) noted interpersonal communication can respond to changing contexts, diverse audience needs and spontaneous events and so can potentially exert more influence on the visitor. Interpersonal interpretation allows a dynamic two way interaction between the management representative and the visitor. However, given the costs, such as training and wages, interpersonal interpretive programmes can be relatively expensive.

In contrast, non-personal interpretation is essentially static in terms of having little or no scope to adapt to immediate and changing contexts and visitor needs. The visitor is required to extract meaning from non-personal media in what is effectively a one-way interaction. Non-personal media may thus be considered less likely to influence visitors given the lower intensity of interaction but presents a less costly method of communication over the life of an interpretive program (Hughes, 2004). Managers must thus balance cost of interpretive media with the perceived effectiveness and likely influence on visitors.

As a management tool, the ultimate assumed benefit of interpretation, beyond influencing beliefs, knowledge, attitudes and behaviour, is the reduction of visitor impacts on the site (Moscardo, 1998; Sureda *et al.*, 2004). This rests upon the assumption that interpretation will be successful in influencing visitors to the extent that it translates into an immediate on-site behavioural response (Fishbein & Manfredo, 1992; Howard, 2000). Research suggests there is a link between interpretation and behavioural influence based on the extent to which visitors identify with the interpretation material and are provoked to think along the themes presented; this in turn may influence beliefs, attitudes and ultimately behaviour (Ham, 2007). Using interpretation to influence behaviour is thus an indirect and uncertain (in terms of identifiable benefits) method (Augoustinos & Walker, 2002; Fishbein & Manfredo, 1992; Kohl, 2004).

Given the significant investment in interpretation by natural area managers, some form of evaluation is desirable to determine the effectiveness of

interpretation programmes and so, justify the costs. Evaluation may be defined as a systematic, objective assessment of the effectiveness, efficiency and appropriateness of a programme or part of a programme (McArthur, 1994). This is critical for producing constructive and reliable feedback used to improve management decisions and develop effective practices. The interpretation evaluation process can be hindered by the inherent vagaries associated with establishing relationships between information assimilation, attitude change and behaviour change (Kuo, 2002). While it is relatively straightforward to evaluate what visitors think and feel about the on-site interpretation, establishing links with behavioural influences and how the interpretation might be altered to elicit different outcomes is more complicated (Ham, 2007). Perhaps because of this, evaluation of interpretive activities remains marginal in wider evaluation of natural area management (Sureda *et al.*, 2004).

To gain a better understanding of the status of interpretive evaluations in practice, we reviewed published research on the effectiveness of environmental interpretation. Our objective in the analysis was to compare different interpretive approaches in terms of outcomes in order to determine if linkages could be established between type of interpretation and success.

Methods

We undertook the research as a desktop review of available information regarding environmental interpretation. We had two objectives: to explore the internal validity of available published evaluative research and; to compare different interpretive approaches in terms of outcomes. The definition of validity we adopted is discussed in the subsequent section.

Reports used in our analysis were by necessity limited to published, readily available evaluative studies investigating the influence of interpretive programmes on visitors in natural areas. We excluded more formalised education and museum interpretation evaluations as our objective was to understand the interpretation experience specifically in a natural area resource management perspective. While evaluative studies exist in an unpublished form or as internal documents within natural area management agencies; unfortunately such documents were not accessible for this study. We utilised electronic international library databases including ProQuest, Science Direct, Swetswise, Informit and Wiley Interscience.

For the purposes of this paper, we have broadly classified the variety of interpretation into non-personal and interpersonal media. Interpersonal interpretation includes face-to-face interactions between visitors and staff or volunteers delivering the interpretation on-site. This may take the form of spontaneous interactions between site staff, guided tours, information desk personnel, formal presentations and organised entertainment activities and so on. Non-personal interpretation includes material delivered using various media (such as signs, brochures, computers, touch tables, art) that does not involve a personal interaction between the visitor and a site management representative (Hughes, 2004; Newsome *et al.*, 2002; Wearing & Neil, 1999). In addition, we grouped studies according to the primary purpose(s) of the reported environmental interpretation programmes. The groupings included knowledge gain, attitude change, behaviour change and visitor satisfaction or a combination of these criteria.

Objective 1: Explore the internal validity of evaluative studies

We took guidance concerning internal validity from Babbie (1999) and Neuman (2003). The validity of each study was established according to four measures: adequate sample size, methodological rigour, use of a control group, and post-experience follow-up. In order for the study to be assigned valid status, all four measures needed to be met. We stress that the concept of validity applied in this research is by no means the only form of validity, and readily acknowledge the existence and legitimacy of other methodologies and possible validity constructs (e.g. the peer-review process applied to journal publications is another important indicator of scientific validity).

The criteria for adequate sample size was met if, for a given the study, it was indicated that the sample size was statistically valid (i.e. representative of the visitor population and could be manipulated statistically). Methodological rigour was satisfied if the study employed paired pre- and post-experience testing, as this paired data collection method allows for comparability and analysis of results in terms of exposure to interpretation in isolation from other influences. We based this qualification on the advice provided in previous research (e.g. Babbie, 1992; Tubb, 2003).

The use of a control group and subsequent comparison of findings between the control and experimental group provides a further measure of validity, contingent on statistical assurances of comparability based on the socio-demographics of the two groups (Orams, 1997; Tubb, 2003). The final measure relates to post-interpretive experience follow-up, defined as investigation (three to six months later or beyond) to determine if any changes in knowledge, attitudes or behaviour recorded immediately after the interpretive experience are transient or more permanent. This particular timeframe was chosen in that was likely to minimise temporal discrepancy, which arises from a long delay between measurement of attitude and resultant action (Fishbein & Ajzen, 1975; Gotch & Hall, 2004; Kollmuss & Agyeman, 2002).

Objective 2: Compare different interpretive approaches in terms of outcomes

To further understand the suitability of interpretation as a natural area management tool, we classified different interpretive approaches (e.g. non-personal versus interpersonal interpretation). We then compared these in terms of outcomes (i.e. the interpretive programme was deemed successful or not successful in positively influencing environmental attitudes and/or behaviours) to explore the relationship, if any, between type of interpretive media and outcome.

Results and Discussion

A total of 21 studies evaluating the outcomes of particular natural area interpretation programmes were reviewed (Table 1). Other studies (e.g. Knapp & Yang, 2002; Mayes *et al.*, 2004; McGehee & Santos, 2005; Prentice *et al.*, 1998; Ryan *et al.*, 2000; Wallace & Gaudry, 2002) could not be examined according to our method or were outside the scope of the research. For some interpretation programmes, more than one evaluation had been published (e.g. studies of the Skyrail Rainforest Cableway in Queensland, Australia by Moscardo, 1998;

Table 1 Interpretation case studies reviewed

<i>Author</i>	<i>Location</i>	<i>Interpretive media used</i>	<i>Success indicator</i>
Brody <i>et al.</i> (2002)	USA	Signs, brochure, walkways (non-verbal media)	Knowledge, attitude change
Cole <i>et al.</i> (1997), McCool & Cole (2000)	USA	Signs (non-verbal media)	Knowledge
Fallon & Kriwoken (2003)	Tasmania, Australia	Visitor centre (non-verbal media)	Visitor satisfaction
Howard (2000)	QLD, Australia	Visitor centre, guided tours (both non-verbal and verbal media)	Knowledge
Hughes & Morrison-Saunders (2002a, 2002b)	Western Australia	Site design, minimal signage (non-verbal media)	Knowledge, attitude change
Lipman & Hodgson (1979)	New Mexico, U.S.A	Presentations, guided walks (verbal media)	Attitude change
Mallick & Driessen (2003)	Tasmania, Australia	Signs (non-verbal media)	Attitude change
Moscardo (1999)	QLD, Australia	Brochure (non-verbal media)	Knowledge
Moscardo (1998), Pearce & Moscardo (1998)	QLD, Australia	Skyrail Rainforest Cableway, signs, visitor centre, rangers (both non-verbal and verbal media)	Knowledge, attitude change
Moscardo <i>et al.</i> (1997)	QLD, Australia	Pictorial signs (non-verbal media)	Knowledge
Novey & Hall (2007)	New Mexico, USA	Audio tours, signs (both non-verbal and verbal media)	Knowledge
O'Loughlin (1996)	Tasmania, Australia	Print and audio-visual media, track rangers (both non-verbal and verbal media)	Attitude and behaviour change
O'Neill <i>et al.</i> (2004)	Western Australia	Visitor centre (non-verbal media)	Visitor satisfaction

(Continued)

Table 1 Continued

<i>Author</i>	<i>Location</i>	<i>Interpretive media used</i>	<i>Success indicator</i>
Orams & Hill (1998)	QLD, Australia	Visitor centre, ranger presentations (both non-verbal and verbal media)	Behaviour change
Orams (1997)	QLD, Australia	Visitor centre, ranger presentations (both non-verbal and verbal media)	Knowledge, attitude change
Papageorgiou (2001)	Greece	Signs, part-time rangers (both non-verbal and verbal media)	Knowledge
Porter & Howard (2002)	QLD, Australia	Signs, information stands, rangers (both non-verbal and verbal media)	Knowledge
Schanzel & McIntosh (2000)	New Zealand	Guided tour, brochures (both non-verbal and verbal media)	Knowledge, attitude change
Stewart <i>et al.</i> (1998)	New Zealand	Visitor centre, print and audio-visual media, presentations (both non-verbal and verbal media)	Attitude change
Townsend (2003)	British Virgin Islands	Presentations (verbal media)	Behaviour change
Tubb (2003)	UK	Visitor centre (non-verbal media)	Knowledge, attitude change

Pearce & Moscardo, 1998). The majority of the studies were collected from published scientific journals (15 studies), with a small minority coming from scientific reports (two) and within books (four). Although the literature search was conducted on an international basis, most studies located were from Australia (12 studies), followed by studies from the United States (four), Europe/United Kingdom (two), New Zealand (two) and the British Virgin Islands (one).

Two of the studies identified focused on behaviour change as a primary evaluative criterion. The remainder of the studies focused on increasing knowledge (seven studies), influencing attitudes (three studies) or both knowledge gain and attitude influence (six studies) as their primary evaluative criteria. One study had stated evaluative criteria of both attitude and behaviour influence, and two further studies specifically targeted visitor satisfaction. We acknowledge that there have likely been many more evaluation studies conducted internally by natural area managers and consultants. These do not feature in the literature reviewed in this study due to difficulty of obtaining such work consistently.

Validity

The internal validity of each of the studies was assessed according to the criteria discussed previously. A wide spectrum of evaluation methods is present among the studies and it appears that no single method dominates (Table 2).

Based on the criteria for validity applied in this review, none of the studies appeared to fulfil all aspects. Interestingly, about half of the studies reviewed did not use pre-experience and post-experience sampling to evaluated interpretive influences on visitors. According to Lee and Balchin (1995), studies based on post-experience testing alone are methodologically less reliable in that they fail to accurately assess prior attitudes. The use of paired pre- and post-experience samples is advocated as a preferred, scientifically valid approach by some researchers (e.g. Mayes *et al.*, 2004; Tubb, 2003). The use of before and after testing enables a clear assessment of changes in visitor variables such as attitudes or knowledge that may then be associated with the intervening experience (e.g. Howard, 2000; Orams, 1997; Tubb, 2003). In addition, the concurrent use of standardised observation (recording observations in regards to a pre-determined set of behaviours) can augment survey responses as a means of verifying claims or adding depth of understanding to data (Kuo, 2002; Moscardo & Woods, 1998; Novey & Hall, 2007; Tubb, 2003).

An adequate sample size and employing control and experimental groups of a comparable nature forms another important aspect of validity. This enables attribution of positive outcomes to the existence of interpretation, as opposed to extraneous factors (Kuo, 2002; Moscardo, 1999; Novey & Hall, 2007; Orams, 1997; Tubb, 2003). Statistical comparability of control and experimental groups can generally be assured if the socio-demographics of the groups are not significantly different and the two groups differ primarily in exposure to interpretation (Orams, 1997; Tubb, 2003).

Four studies (Hughes & Morrison-Saunders, 2002a, 2002b; Mallick & Driessen, 2003; Novey & Hall, 2007; Orams & Hill, 1998) appeared to almost fulfil the validity criteria imposed by this review. These evaluative studies included a large visitor sample size, use of both pre- and post-experience testing and

Table 2 Measures of scientific validity

<i>Author</i>	<i>Adequate sample size</i>	<i>Methodological rigour (pre/post tests used?)</i>	<i>Was a control group used?</i>	<i>Follow-up after immediate experience?</i>
Brody <i>et al.</i> (2002)	√	√	—	—
Cole <i>et al.</i> (1997), McCool & Cole (2000)	√	—	—	—
Fallon & Kriwoken (2003)	√	—	N/A	N/A
Howard (2000)	√	√	—	√ (6 months after)
Hughes & Morrison-Saunders (2002a, 2002b)	√	√	√	—
Lipman & Hodgson (1979)	—	—	√	—
Mallick & Driessen (2003)	√	√, observation	√	—
Moscardo (1999)	√	—	√	—
Moscardo (1998), Pearce & Moscardo (1998)	√	√, observation	—	—
Moscardo <i>et al.</i> (1997)	√	√	—	—
Novey & Hall (2007)	√	√	√	—
O'Loughlin (1996)	—	—	√	—
O'Neill <i>et al.</i> (2004)	√	√, observation	N/A	N/A
Orams & Hill (1998)	√	√, observation	√	—
Orams (1997)	√	—	√	√ (2–3 months after)
Papageorgiou (2001)	√	—	—	—
Porter & Howard (2002)	√	—	—	—
Schanzel & McIntosh (2000)	—	—	—	—
Stewart <i>et al.</i> (1998)	—	—	—	—
Townsend (2003)	—	—	—	—
Tubb (2003)	√	√, observation	—	—

√ = measure of internal validity was satisfied.

— = measure of internal validity was not satisfied.

Observation = observation was used as a further evaluative technique.

involvement of both control and experimental groups (Table 2). Other studies such as Orams and Hill (1998) and Orams (1997), did not use pre-experience testing and/or control groups but did conduct follow-up evaluation of stated intention to act and behaviour change; in essence this provides a further measure of validity absent in the four studies mentioned above.

The studies included in this review illustrate the spectrum of evaluation methods in use in the field. Imposing a single constructed ideal of validity on the case studies highlighted the difficulties inherent in attempting to assess the diverse field of environmental interpretation. While interpretation is considered as a specific profession or field of research, the diversity within this area works against use of a single evaluative model (Lather, 2006). Although theoretically appealing, any attempt to apply a single evaluative process in environmental interpretation is likely to favour certain methodologies and interpretive approaches, creating a skewed view of the status of interpretation evaluation. This then presents difficulties in comparability between evaluations of various interpretive programmes and thus, identification of successful application and good practice.

Interpretive approach versus outcome

Interpretive approaches were considered in terms of non-personal or interpersonal media. Nine of the reviewed studies evaluated solely non-personal interpretive media and 10 studies evaluated interpretive programmes with a combination of non-personal and interpersonal media. Two studies evaluated solely interpersonal interpretive programmes (Table 1). A variety of interpretive media (both non-personal and interpersonal) were evident. Media of use in interpretive programmes consisted of text-based (evaluated in eight studies) and pictorial signs (one study), rangers (four studies), guided presentations (three studies), audio tours (one study) talks (five studies), visitor centres (eight studies) and print media (five studies). These tallies are not mutually exclusive as many interpretive programmes consist of more than one type of media. Two studies reviewed interpretive programmes where physical site design was used as a further interpretive tool (Hughes & Morrison-Saunders, 2002a, 2002b; Moscardo, 1998; Pearce & Moscardo, 1998).

With this variety of interpretive media in mind, some interesting observations have been made in the individual studies. Roggenbuck (1992) commented that different interpretive contexts will be suited to different kinds of interpretive media. It follows, therefore, that no one type of interpretive media appears to be more successful than another in terms of achieving stated programme aims. Certain factors, however, appeared to be associated with interpretive programme success or failure in accordance with initial management objectives.

For example, personal relevance imparted by the message (e.g. Cole *et al.*, 1997) as well as issues regarding message repetition were considered important factors in success. Roggenbuck (1992) maintains that repetition will increase message effectiveness up until a certain point, beyond which it may lead to message rejection. Other researchers (e.g. McGehee & Santos, 2005; Russell & Hodson, 2002; Ryan *et al.*, 2000) highlighted the importance of evoking emotion as a catalyst in encouraging pro-environmental behaviour. This may be more difficult to achieve through text-based signs as compared with a personal

interaction with a guide or ranger. Providing visitors with a tangible opportunity to act upon newly formed attitudes and intentions ('opportunity to act') following the interpretive experience was linked with programme success (e.g. Mallick & Driessen, 2003; Orams, 1997; Townsend, 2003). Further factors seemingly linked with success included the use of interpersonal communication (e.g. Moscardo, 1998; Schanzel & McIntosh, 2000) and targeting audiences (e.g. Fallon & Kriwoken, 2003).

Several authors emphasised the necessity of tailoring interpretation to the intended audience (e.g. Kuo, 2002; Moscardo, 1998, 1999; Porter & Howard, 2002). O'Loughlin (1996) utilised previous market research to determine the general information needs and demographics comprising the specific audience of the interpretive programme. Moscardo *et al.* (1997), on the other hand, did not conduct any initial visitor research. The authors concluded this resulted in the provision of an ineffective interpretation programme as visitors already possessed the knowledge provided by the interpretive programme prior to their visit.

Of the 21 case studies, 19 considered that the interpretive programme evaluated was successful or at least partly successful in terms of achieving initial management objectives. None of the studies reviewed met all of our criteria. This does not mean, however, that the studies reviewed are by definition unsound; rather it reflects perhaps the limitations of using a single definition to determine validity (Lather, 2006). We suggest that further studies are needed to assess the effect of interpretation on the variables influencing eventual human behaviour in order for more definitive and comparable conclusions to be drawn.

Conclusion

Based on this review, it appears that the emphasis of evaluative studies lies with quantifying knowledge gain and attitude change as interpretive outcomes. Although attitudes in particular are thought to be linked to behavioural intentions (Fishbein & Manfredo, 1992; Gotch & Hall, 2004; Howard, 2000), assessing visitor knowledge and attitudes remains removed from quantifying actual behaviour change as a result of the interpretive experience. The complexity of interrelationships between information assimilation, attitudes and behaviour change is extremely complex and difficult to evaluate on-site. It is evident that evaluative research directed towards examining the relationship between these factors through other methodological approaches such as the Theory of Planned Behaviour and other theoretical behaviour frameworks (e.g. Gotch & Hall, 2004) would prove useful. Clearly this is a difficult task and the long-term research necessary to investigate any incidences of cause and effect could be complicated by external factors (Kuo, 2002) that may serve to cast doubt on the validity of any positive cause-effect findings.

The progression of interpretation as a viable visitor management tool is constrained by a number of issues, foremost of which is the multiplicity of evaluative techniques and lack of consensus as to the most appropriate method (Hughes, 2004). We employed a specific construct of validity in undertaking this research. This has shown that meta-evaluation of environmental interpretation studies based upon a single construct of validity is limiting. The advantages of a

single evaluative approach lie in standardisation and the subsequent improved comparability of evaluations and success in interpretation programmes. While theoretically advocating for the development of a dynamic evaluative framework to ensure effective monitoring and evaluation of environmental interpretation programmes, we acknowledge that practically, such a framework may not be possible.

Evaluation of interpretation programmes is sporadic amongst natural resource management organisations. This is perhaps partly owing to the apparent diversity of evaluative techniques and the subsequent complexity of selecting and applying evaluation to an interpretive programme. Publication of robust evaluative studies to in the public literature may function to provide a loose grouping of techniques that managers may apply. This will also facilitate replication and transferral of effective evaluative techniques.

We advocate moves to build on previous research to ensure the continuing progression of environmental interpretation evaluation in the field of natural area visitor management. This requires identification of a core group of evaluative techniques that may be applied across the interpretation spectrum. This will ultimately enhance the effectiveness of interpretation as a means of enhancing environmental protection in natural areas.

Correspondence

Any correspondence should be directed to Angus Morrison-Saunders, School of Environmental Science, Murdoch University, South Street Murdoch, Western Australia 6150 (a.morrison-saunders@murdoch.edu.au).

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